What about Hobfoll's Resources Conservation Model in a Digital Society? Internet use as a Moderator of the Relationship between Personal Resources and Stress in Older Adults.

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Abstract

Background: Internet use has dramatically increased worldwide, with over two-thirds of the world's population using it, including the elderly population. Technical resources, such as internet use, has been shown to influence psychological variables, such as stress. Furthermore, according to Hobfoll's COR theory, stress perception largely depends on individual's personal resources and their changes. While personal resources loss and stress are negatively associated, we ignore the role that technical resources plays on the relationship between personal resources and stress.

Objective: This study aims at investigating the moderating role of technical resources (internet use) on the relationship between personal resources and stress, in young and older adults.

Methods: A total of 275 young adults (18 to 30 years) and 224 older adults (65 years or older) indicated their levels of stress, change in personal resources (i.e., cognitive, social, and self-efficacy resources loss and gain), and internet use. Variance analyses, multiple regression, and moderation analyses were performed to investigate the correlates of stress.

Results: Results showed that older adults, despite experiencing high levels of resource loss and less resource gain, were less stressed than younger adults. We observed that the relationship between resource loss, resource gain, and stress in older adults was moderated by their level of internet use. Specifically, older adults who used internet more frequently were less stressed when they experienced both high levels of loss and gain, compared to their counterparts who used less internet in the same conditions. Furthermore, older adults with low resource gain and high resource loss expressed less stress when they used more internet compared to those who had low internet use.

Conclusions: These findings highlight the importance of internet use in mitigating stress among older adults experiencing resource loss and gain, emphasizing the potential of digital interventions to promote mental health in this population.

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“What about Hobfoll’s Resources Conservation Model in a Digital Society? Internet use as a Moderator of the Relationship between Personal Resources and Stress in Older Adults”.

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Abstract

Background. Internet use has dramatically increased worldwide, with over two-thirds of the world's population using it, including the aged population. Technical resources, such as internet use, have been shown to influence psychological processes positively, such as stress. Following Hobfoll's COR theory, stress experience largely depends on individual's personal resources and their changes. While personal resources loss have been shown to lead to stress, we know little regarding the role that technical resources may play on the relationship between personal resources and stress.

Objectives. This study aims at investigating the moderating role of technical resources (internet use) on the relationship between personal resources and stress, in young and older adults.

Methods. A total of 275 young adults (18 to 30 years) and 224 older adults (65 years or older) indicated their levels of stress, change in personal resources (i.e., cognitive, social, and self-efficacy resources loss and gain), and internet use. Variance analyses, multiple regression, and moderation analyses were performed to investigate the correlates of stress.

Results. Results showed that older adults, despite experiencing higher levels of resource loss (1.82 *vs.* 1.54, $p < .001$) and less resource gain (1.82 *vs.* 2.31; $p < .001$), were less stressed than younger adults (1.99 *vs.* 2.47; $p < .001$). We observed that the relationship between resource loss, resource gain, and stress in older adults was moderated by their level of internet use ($\beta = .09$, $p = .05$). Specifically, older adults who used the internet more frequently were less stressed when they experienced both high levels of loss and gain, compared to their counterparts who used less internet in the same conditions. Furthermore, older adults with low resource gain and high resource loss expressed less stress when they used the internet more often compared to those with low internet use.

Conclusions. These findings highlight the importance of internet use in mitigating stress among older adults experiencing resource loss and gain, emphasizing the potential of digital interventions to promote mental health in this population.

Keywords: Internet use; Aging; Stress; Personal resources; Technical resources; Hobfoll's Conservation of Resource (COR) theory

Introduction

Internet use has increased drastically in the last decade, with two thirds of the world's population being familiar with it nowadays [1]. For example, in Switzerland, 90 % of people over the age of 15 use the internet daily, and even 70.3% of people over 65 use it regularly [2]. However, few studies explored the role of internet use on psychological processes, such as stress, in the context of personal resources loss, and its age-related specificities.

Older adults are often confronted with a variety of challenges that can result in social, health, and cognitive losses. Specifically, older adults may experience reduced social support networks, decreased physical functioning, and a decline in cognitive abilities such as memory, and executive functioning [3-4]. These losses can have a negative impact on overall well-being, including increased levels of stress, depression, and anxiety [5-6]. Moreover, individuals tend to place greater value on avoiding losses than on acquiring gains, and as a result, are often more motivated to take actions to avoid potential losses than to pursue potential gains. Technical resources can serve as an additional resource that helps older adults maintain or improve their level of mental health in various ways [7-8], such as through online social interaction, online counseling, health services, or cognitive stimulation. In other words, technical resources can help older adults reach their maintenance and loss managements goals.

In this study, we investigated the effect of technical resources, specifically internet use, and the extent to which they can buffer the relationship between personal resources on stress in both younger and older adults.

Age-related differences in personal resources and their impact on stress levels

Personal resources are typically considered to be attributes that individuals value and that enhance their ability to function effectively in terms of controlling and impacting their environment [9-10]. Moreover, individuals' personal resources, including their health, social support, and financial

means, along with their mental strengths, such as self-efficacy, change over the course of life, due to a combination of factors, including biological aging, life experiences, and environmental factors. According to the lifespan theory, personal resources tend to decrease as individuals age, putting older individuals at risk for decline in overall well-being [11]. For instance, age-related changes such as declining social networks, poor mobility, retirement, and development of chronic illness can contribute to social isolation and feelings of loneliness in older adults [12-13-14], which were associated with increased stress, and poor well-being [15-16-17].

Various theories suggest that older adults may develop compensatory strategies to manage the decline in personal resources and maintain well-being [5-18-19-20-21-22]. According to Hobfoll's COR theory [20] individuals seek to gain new resources to maintain or enhance their well-being, particularly in the face of stress and adversity [6]. More specifically, when individuals experience a loss of resources, such as a decline in health or social support, they may be more vulnerable to stress and negative well-being outcomes. However, if they can gain new resources, this can help to offset the negative impact of the loss and buffer against the effects of stress. Thus, while resource losses can have a significant negative impact on individuals' well-being, resource gains can help to replenish those losses and promote resilience.

For older adults, resource gains may involve engaging in activities, such as taking classes, volunteering, participating in social activities, or learning new skills. Specifically, technical resources provide a support to access to new activities [23]. However, the extent to which internet use influences the relationship between personal resources and stress in aging is not yet fully understood. The present study aims to better understand how the internet can be used as a resource to support the well-being of older adults, particularly in the context of stress and aging.

Internet Use Role as a Resource Gain in the Context of Older Adults' Stress

The internet use can facilitate the gain of resources, providing older adults with additional means

to cope with stress and improve their mental health outcomes [24-25-26-27-28-29]. For instance, the internet can serve as a platform for social support, information seeking, and engaging in meaningful activities, all of which can contribute to better mental health outcomes in later life [23]. More specifically, higher levels of internet use predicted higher levels of social support, reduced loneliness, better life satisfaction, and psychological well-being among older adults [26].

For example, by using the internet for social interactions, older adults can increase their social networks, receive emotional support, and build relationships with others [28-29-30] to reduce social isolation and stress. For example, Li and colleagues [31] examined the relationship between social isolation, cognitive functioning, depression, and internet use among older adults. Results showed that social isolation was significantly associated with poorer cognitive functioning and higher levels of depression among older adults. Moreover, internet use moderated the relationship between social isolation and cognitive functioning, suggesting that internet use may have a protective effect on cognitive functioning among socially isolated older adults. Finally, results showed that internet use was associated with lower levels of depression among older adults, regardless of their level of social isolation. This suggests that internet use could serve as a protective factor for cognitive functioning and that it represents as an important factor for improving mental health outcomes among older adults.

Moreover, by information research through the internet, older adults can gain knowledge and skills to manage stressors that arise in later life. Being confronted with or anticipating age-related loss of physiological functioning, older adults are interested in acquiring health knowledge [32-33-34]. Higher online health literacy is associated with more positive health behaviors and better health knowledge and attitudes in older adults [35]). Additionally, engaging in other meaningful activities, such as online learning, gaming, shopping, and hobbies, can also have positive effects on the psychological outcomes of older adults [36-37-38-39-40-41]. For example, Gallistl and Nimrod [36] examined the relationship between internet use for leisure activities and well-being among older

adults. Results showed that older adults who used the internet for leisure activities reported higher levels of subjective well-being, social connectedness, and life satisfaction than those who did not use the internet for these activities. Moreover, several studies reported that online gaming improved older adults' physical and cognitive functioning [42-43], social interaction, enjoyment, and decreased social isolation [44-45-46]. These studies commonly suggest that by participating in online activities, older adults can gain new skills, challenge themselves, increase their social networks, and find enjoyment in their free time.

Little research has been conducted on the relationship between personal resources, internet use, and stress at different ages. However, determining the potential benefits of internet use in managing stress in later life may highlight the importance of promoting access to and use of technology among older adults.

The present study

The main objective of the present study was to better understand the underlying mechanisms contributing to age-related differences in stress as a function of changes in personal resources and internet use. More specifically, we investigated (a) age-related differences in stress and its associated predictors, (b) whether the level of resource gains buffered the relationship between resource losses and stress in young and older adults, replicating Hobfoll's findings [20], and (c) whether the profile of internet use in young and older adults moderated the relationship between resource gains and resource losses on stress levels.

First, we tested the hypothesis that stress levels differed by age group. We expected that older adults reported lower levels of stress compared to young adults. This hypothesis was based on previous research which has consistently demonstrated that older adults are exposed to fewer stressors than younger adults [46-47], leading to better well-being outcomes, such as less stress [47-48-49].

The second set of hypotheses concerned the replication of the Conservation of Resources

(COR) theory [20], describing that resource losses had a considerably stronger impact on individual's stress perception compared to resource gains [6]. Moreover, COR theory explained that resource gains buffer the effect of resource losses on stress [20]. Accordingly, we expected that (a) more resource losses would be associated with a higher level of stress, (b) resources losses had a stronger impact on stress than resources gains, and (c) the relationship between resource losses and stress would be moderated by the level of resource gains, with higher levels of gains helping to buffer the negative impact of losses on stress levels.

Finally, we hypothesized that the moderating effect of resource gains on the relationship between resource losses and stress would vary based on levels of internet use, presenting distinct profiles for the young and older adults. First, given previous findings showing that internet use may have a positive impact on older adults' well-being and stress levels [51-52-53], we expected that internet use would moderate the relationship between resource gains, losses, and stress: Individuals who reported higher levels of internet use would experience a greater protective effect of resource gains (i.e., stronger effect of gains) compared to those who reported lower levels of internet use. This hypothesis was based on previous studies demonstrating that higher utilization of internet was associated with higher levels of stress, depression, loneliness, and anxiety in young adults [54-55].

Methods

Procedures and Participants

We conducted a cross-sectional study in the French-speaking part of Switzerland. The participants were native or fluent French-speakers. We recruited N = 510 individuals, of which n = 280 were younger than 30 years old (M = 25.00), and n = 230 were older than 65 years old (M = 73.55; see Table 1 for detailed participants' characteristics). Young participants were mainly undergraduates from University of Lausanne, while the rest of the participants were recruited using the snowball sampling technique [56]. Recruited individuals volunteered to participate in the study and were not remunerated. For being included, participants had to be able to speak and understand

French, and had to be aged between 18 and 30 years old or more than 65 years old. Participants filled out an online open questionnaire containing questions on stress, and potential predictors/moderators such as personal resources and internet use (i.e., questions presented in a specific order).

The sample size used in this experiment was based on an a-priori power analysis conducted in G*Power 3.1 [57]. We assumed an effect size of Cohen's f = 0.06, which was derived from previous relevant studies on the buffer effect of resource gains on the association between resource losses and stress [58-59], and an alpha of 0.05. Specifically, a total sample size of 404 participants (N = 202 per group) provided 90% power to detect effects. To exceed this criterion and achieve greater than 80 % power, we recruited 510 participants (i.e., 280 young adults and 230 older adults).

Ethical considerations. The study was approved by the Social and Political Sciences Ethics Committee of the University of Lausanne (C-SSP-092022-00002). Written informed consents were obtained from participants before the questionnaire was made available and they were informed that they could decide to quit the study at any point. This ensured that participants were well-informed of the study's objectives and the potential impact of their contribution. Furthermore, participants were made aware of the duration of their involvement, which entailed completing an online questionnaire lasting approximately 30 minutes (i.e., the questionnaire comprised 27 pages with15 items per page, and the possibility to go back)

Before deployment, the questionnaire was tested to ensure its feasibility, enhancing its clarity and ease of completion. For non-applicable items or when participants chose not to respond, options like "not applicable" or "prefer not to say" were provided, respecting participant autonomy while preserving data integrity. Additionally, to ensure valid responses, at least one answer selection per question was mandated, minimizing incomplete or inconsistent submissions, and maintaining data reliability.

The informed consent process outlined the data management protocols, including the types of data

collected, the methodologies employed for data treatment using SPSS software, and the storage solutions provided by Switchdrive. A commitment was made to the participants that their data would be anonymized and held confidentially, with plans for eventual sharing in an open-access data repository (e.g., SwissUbase for 5 years), post-removal of any personally identifiable information. The present study was developed using SurveyMonkey (for Checklist for Reporting Results of Internet E-surveys, see Multimedia Appendix 1), an online survey platform known for its ease of use and robust data analysis tools. It allows the creation, distribution, and analysis of surveys, making it an ideal choice for collecting detailed feedback and insights. Additionally, SurveyMonkey's strong emphasis on data security and privacy ensures the integrity and confidentiality of the data collected in the study. Multiple submissions would be controlled by monitoring IP addresses and the anonymous codes assigned to each participant, in addition to checking for consistency in the responses. Moreover, analyses were performed on questionnaires that were fully completed. No monetary compensation was provided to participants upon the completion of the questionnaire.

Table 1. Participants' Characteristics (N = 510)

Variables	Young Adults n = 280		Older Adults n = 230		X^2 test for group comparison N = 510	
	M	*SD*	*M*	*SD*		
Age						
Mean	25.00	2.09	73.55	7.16	-	-
Range	18.00 – 29.00	-	65.00 – 98.00	-	-	-
	Frequencies N (%)					
	N	*%*	*N*	*%*	X^2	*p.value*
Gender						
Women	190.00	67.70	130.00	56.50	6.94	.01
Men	90.00	32.30	96.00	41.70	5.02	.03
Education						
Obligatory School not Finished	1.00	0.40	16.00	7.00	17.07	< .001
Obligatory School	4.00	1.40	51.00	22.20	56.46	< .001
Professional Formation	18.00	6.50	79.00	34.30	63.91	< .001
General Education	4.00	1.40	5.00	2.20	0.41	.56

Professional Maturity	15.00	5.40	10.00	4.30	0.28	.60
Gymnasium Maturity	49.00	17.60	9.00	3.90	24.00	< .001
Specialized University	15.00	5.40	20.00	8.70	2.20	.14
University	173.00	62.00	37.00	16.10	108.87	< .001
Doctoral Degree	0.00	0.00	3.00	1.30	3.67	.06
Financial Adequacy						
More Money than Needed	54.00	19.40	59.00	25.70	3.18	.08
Enough Money	177.00	63.40	158.00	68.70	1.30	.25
Less Money than Needed	48.00	17.20	13.00	5.70	15.55	< .001

Notes. M: Mean level; *SD*: Standard Deviation. Obligatory school not finished corresponding to less than 11 years of education; obligatory school to 11 years of education. professional formation. general education. professional maturity. and gymnasium maturity to 4 additional years of education; university. and specialized university to 3 to 5 additional years of education; and doctoral degree to 3 to 5 additional years of education.

Measures

Predictors

Socio-demographic Variables - Demographic variables included age (in years), gender (0 = *men*, 1 = *women*), education level (1 = *obligatory school not finished*, 2 = *obligatory school*, 3 = *professional formation*, 4 = *general culture*, 5 = *professional maturity*, 6 = *gymnasium maturity*, 7 = *specialized university*, 8 = *university*, 9 = *doctoral degree*), and financial adequacy (1 = *more money than needed*, 2 = *enough money*, 3 = *less money than needed*).

Personal Resources - Personal resources were assessed with the 13-items Personal Resources Questionnaire – Short Form [60]. The short version of the questionnaire included items concerning cognition, self-efficacy, and social relations. For the present study, we used two parts of the questionnaire: losses (“To what extent did the listed resources decrease in the last year?”), and gains (“To what extent did the listed resources increase in the last year?”; a total of 13 items x 2 = 26 items, for details see Table 2). Each item was evaluated on a 5-points Likert scale, ranging from 1 = *none* to 5 = *great amount*. Mean composite scores were calculated for losses and gains. Specifically,

we created two types of indicators (i.e., domain-general resources = resource gains and losses), and three types of resources in each condition (i.e., domain-specific resources = self-efficacy, cognition, and social resources). Lower scores indicate lower levels of each personal resources condition.

Table 2. Details of Personal Resources Questionnaire Used in the Present Study.

Resources	Number of Items	Items	Cronbach Alpha	
			Gains	Losses
Cognition	5	"Sound cognitive functioning" "Intelligence" "Good memory ability" "Ability to concentrate" "Ability to think and understand quickly"	0.96	0.93
Self-efficacy	4	"Sense of control over my life" "Ability to control my future" "Ability to achieve my goals" "Ability to put my plans into action"	0.95	0.92
Social Relations	4	"Companionship of other people" "Close relationship to at least one friend" "Positive relationships partner" "Close relationship to one or more family members"	0.79	0.64

Internet Use - Internet use was assessed with the 8-items Mobile Device Proficiency Questionnaire [61] measuring participants' abilities to perform on internet with a mobile device (example items:

"Using a mobile device I can read the news on the Internet?"). Each item was scored on a 5-point Likert scale, ranging from 1 = *never tried* to 5 = *very easily*. A mean composite score was created with lower scores indicating low levels of internet use. Cronbach's alpha for the present study was .96.

Outcome Variable

Stress - Participant's stress level was assessed with the 5-item Cohen's Perceived Stress Scale [62] (e.g., "In the last month, how often have you felt anxious and stressed?"). Each item was scored on a four-point Likert scale, ranging from 0 = *never* to 4 = *very often*. We created a mean composite score, where lower values indicated a less frequent experience of stress in the last month. Cronbach's alpha was .80.

Analytical Strategy

Differences between young and older adults were first tested on stress and its predictors/moderators (e.g., personal resources), using between-group analyses of variance (ANOVA). We then conducted correlation analyses to gain a better understanding of relationships between age, gender, education level, financial adequacy, personal resources, internet use, stress, and to prepare a more complex moderation analysis.

Second, to replicate Hobfoll's findings [6-21] regarding the strongest effect of resource losses on stress compared to resource gains, we conducted simple regression with participants' characteristics and personal resources variables as predictors. Moreover, to explore the moderating role of resource gains on the relationship between resource losses and stress levels, we conducted moderation analyses using PROCESS version 3.5 by Hayes [63], Model 1. These analyses allowed to examine how the relationship between resource losses and stress levels varied depending on the level of resource gains reported by participants (i.e., two-way interaction Gains x Losses on stress).

Finally, to determine whether internet use influenced the moderation of resource gains on the association between resource losses and stress, a moderation analysis was performed using Model 3 on PROCESS (i.e., version 3.5 for SPSS by Hayes, [63]). This method allowed to test the triple interaction Internet use x Gains x Losses on stress. In all moderation analyses, we controlled age, gender, education level, and financial adequacy.

In each regression and moderation analysis, we divided the analysis in two sets; the first set included the domain-general resources as general gains, and losses; and the second set included the gains and losses of domain-specific resources such as social, cognition, and self-efficacy.

Unstandardized coefficients and 95% confidence intervals (95% CI) were reported. The level of statistical significance was set at $p < .05$. All analyses were performed using IBM SPSS version 26.

Results

Mean-level comparisons

Mean-level tests were conducted to determine the age-related differences in stress and personal resources (Table 3).

Table 3. Young and Older Adults' Mean Stress and Personal Resources Variables.

	Young Adults $n = 275$		Older Adults $n = 224$		Test for Mean Level Differences $N = 499$	
	M	*SD*	*M*	*SD*	*F* (1, 497)	*p.value*
Stress	2.47	0.70	1.99	0.69	58.45	<.001
Resources						
Losses	1.54	0.63	1.82	0.76	14.97	<.001
Social	1.54	0.63	1.60	0.72	1.07	.30
Self-efficacy	1.74	0.92	1.90	0.93	3.62	<.06
Cognition	1.47	0.73	1.92	0.88	39.27	<.001
Gains	2.31	0.97	1.82	0.95	32.72	<.001
Social	2.57	1.04	2.00	1.02	37.37	<.001
Self-efficacy	2.41	1.14	1.82	1.06	34.79	<.001
Cognition	2.03	1.08	1.67	0.99	15.57	<.001
Internet Use	4.91	0.23	3.35	1.38	342.74	<.001

Notes. *M*: Mean level; *SD*: Standard Deviation.

Results showed that older adults were less stressed than younger adults (1.99 *vs.* 2.47; $p < .001$). Older adults had more losses compared to younger adults (1.82 *vs.* 1.54, $p < .001$), while they presented less resource gains (1.82 *vs.* 2.31; $p < .001$). More specifically, the analyses conducted on domain-specific resources (i.e., social, self-efficacy, cognition) revealed that the resource losses in social, self-efficacy, and cognitive domains tended to increase with age, while the social, self-efficacy, and cognitive resource gains tended to decrease with age. Finally, older adults reported less internet use than young adults (3.35 *vs.* 4.91; $p < .001$).

Correlation analysis

We performed correlational analyses to highlight relationships between socio-demographics, independent variables (domain-general, domain-specific resources, and internet use) and stress (Table 4; for a complete table of correlations see Multimedia Appendix 2).

Table 4. Significant Pearson's Correlations (*r*) for participants' characteristics and personal resources to Stress Levels for Total Sample, Young and Older Adults.

	Young adults *n* = 280		Older adults *n* = 230		Total sample *N* = 510	
	r	*p.value*	*r*	*p.value*	*r*	*p.value*
Age	-0.01	.81	0.02	.81	-0.32	< .001
Gender	0.21	< .001	0.11	.08	0.20	< .001
Education level	-0.03	.59	-0.25	< .001	0.08	.08
Financial adequacy	0.28	< .001	0.12	.08	0.25	< .001
Losses	0.42	< .001	0.36	< .001	0.30	< .001
Social	0.21	< .001	0.21	.002	0.18	< .001
Self-efficacy	0.49	< .001	0.40	< .001	0.40	< .001
Cognition	0.30	< .001	0.33	< .001	0.20	< .001
Gains	-0.21	< .001	-0.01	.87	-0.03	.49
Social	-0.08	.18	-0.01	.81	0.04	.41

Self-efficacy	-0.28	< .001	-0.01	.85	-0.07	.12
Cognition	-0.18	.003	-0.00	.97	-0.04	.35
Internet Use	-0.05	.39	-0.17	.01	0.12	.005

Notes. r: Pearson's Correlations

In the total sample group, age, gender, and financial adequacy were correlated with stress: being female, having less money than needed, and being younger were associated with higher stress. Moreover, resource losses were related to higher stress. Specifically, higher stress was associated with more social, cognition, and self-efficacy losses. Participants using the internet more often reported higher levels of stress.

In separate age group analyses, we found that higher levels of stress were associated with higher levels of resources losses, and more specifically social, cognitive, and self-efficacy losses in both young and older adults. Moreover, correlations in young adults group revealed that being female, and having less money than needed were associated with higher stress. Furthermore, higher levels of domain-general resource gains in young adults were associated with stress, and domain-specific resource gains such as cognitive and self-efficacy were related to being less stressed. Concerning the older adult group, analyses revealed that having higher levels of education was associated with lower stress. Finally, while the use of internet was not associated with stress scores among younger participants, it was negatively associated with stress among older participants, indicating that more internet use was linked with lower stress levels.

Moderation Analyses

Regarding the profiles of internet use between younger and older adults we found notable differences. Specifically, young adults exhibited uniformly high usage rates (e.g., Median [Min, Max] = 5.00 [3.38, 5.00]), whereas older adults demonstrated a considerable range in their internet usage behavior, ranging from very low to very high internet use (e.g., Median [Min, Max] = 3.56 [1.00, 5.00]). Regarding the moderating role of age on the link between resource loss, resource gain

and internet use on stress, we, initially, tested a model including the age group variable in a quadruple interaction term (loss*gain*internet use*age groups; not presented). However, no significant interaction was found, possibly due to the complexity of the interaction term and the unequal variances in internet usage across age groups. Indeed, the assumption of homogeneity of variances for internet use was not respected (Levene's test; $F(1, 502) = 536.63$, $p < 0.001$), showing a difference in variances across groups. Based on these findings but also on past research on the field, suggesting that internet use may influence the level of stress, we decided to present the following analysis separately for young and older aged individuals (although results should be interpreted with caution). This methodological approach was crucial for understanding how internet use influenced the relationship between resource loss, gain, and stress, allowing for an exploration of usage trajectories characteristic of young and older adults, without the confounding influence of the homogeneous high internet usage found in the younger cohort.

Domain-general resources - First, simple regression (Model 1; Multimedia Appendix 3) revealed that resources indicators accounted for 32% and 20% of the individual differences in stress levels in young and older adults, respectively. Similarly for young and older adults, the strongest predictor was resource losses (young adults: $\beta = .45$, $p < .001$, older adults: $\beta = .37$, $p < .001$), followed by resource gains (young adults: $\beta = -.20$, $p < .001$, older adults: $\beta = -.13$, $p = .012$), suggesting that individuals who experienced higher resource losses and lower gains tended to feel more stressed, as compared to those with lower levels of losses and higher levels of gains.

Secondly, we found a significant two-way interaction (Model 2, Multimedia Appendix 3 and Figure 1) between resource gains and resource losses on levels of stress as the dependent variable in both young and older adults, confirming our second hypothesis ($\beta = .26$ and $\beta = .16$, for young and older adults, respectively). Specifically, individuals with high levels of resource gains who also reported high levels of losses felt less stressed compared to individuals with lower levels of resource gains and high levels of resource losses.

Figure 1. Mean Stress Depending on Level of Gains (High vs. Low) and Losses (High vs. Low) in Young and Older Adults. Slopes' Values Represent the Coefficient and the Confidence Intervals at 95%.

β = .60, [.42, .77]

16, .43]

Finally, internet use influenced the moderation of resource gains on the relationship between resource losses and stress, as seen in a significant three-way interaction between internet use, gains, and losses in older adults (Model 3, Multimedia Appendix 3; β = .09; β = .33, [.21, .46]. More specifically, the third model presented an increase in the index of adjustment (i.e., change in explained variance) with the second one of .05 (ΔR^2 = .05; p = .002). The three-way interaction was not significant in young adults (β = .22; *ns*).

To further the understanding of the three-way interaction in older adults, we examined the conditional effects of resource losses at one standard deviation above (+1 *SD*) and one standard deviation below (-1 *SD*) the mean scores of resource gains (first moderator) and internet use (second moderator; see Table 6 and see Figure 2). As the three-way interaction (Losses x Gains x Internet Use) was not significant in young adults, we reported only the conditional effects of the older adults. Results showed significant moderation effects of resource gains and internet use on the relationship between domain-general losses and stress. Specifically, significant moderation effects were observed only in cases where individuals reported high levels of gains and high levels of internet use (β = .37), as well as in cases where individuals reported low levels of gains and high levels of internet use (β = .55), and low levels of both gains and internet use (β = .66). These results suggest that the use of the internet reinforces the buffering effect of gains on the relationship between resource losses and stress.

Table 6. Conditional Effects of Domain-general Resource losses (i.e., Independent Variable) on at +1 SD and -1 SD of Gains and Internet Use (i.e., Moderators) in Older Adults.

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	Effect	*SE*	*p*	[LLCI, ULCI]
Losses at -1 SD Gains & -1 SD Internet Use	.66	.12	.001	[.34, .89]
Losses at -1 SD Gains & +1 SD Internet Use	.55	.14	.001	[.28, .83]
Losses at +1 SD Gains & -1 SD Internet Use	.04	.17	.84	[-.30, .37]
Losses at +1 SD Gains & +1 SD Internet Use	.37	.08	.001	[.20, .53]

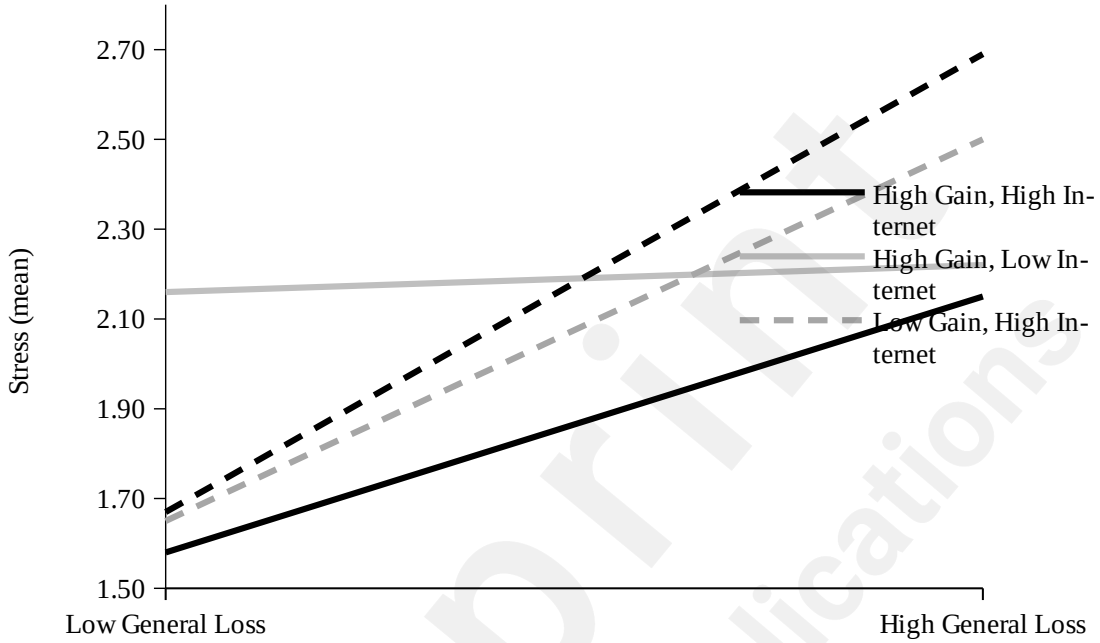

Figure 2. Mean Stress Depending on Level of Gains (High *vs.* Low), Internet use (High *vs.* Low), and Losses (High *vs*. Low) in Older Adults.

According to the third hypothesis, we conducted an additional analysis to examine the differences between individuals with high internet use and those with low internet use in relation to their gains and losses (Table 7). As the three-way interaction (Losses x Gains x Internet Use) was not significant in young adults, we reported only the conditional effects of the older adults. Results showed that internet use effects (i.e., differences between participants who used more internet with participants who used less internet) were marginally significant only in cases where individuals reported high levels of gains and low levels of losses (β = -.21).

Table 7. Conditional Effects of Internet Use (i.e., Independent Variable) on stress at +1 SD and -1 SD of Resource Losses and Gains (i.e., Moderators) in Older Adults.

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	Effect	*SE*	*p*	[LLCI, ULCI]
Internet Use at -1 SD Gains & -1 SD Losses	-.01	.06	.89	[-.12, .10]
Internet Use at -1 SD Gains & +1 SD Losses	-.07	.08	.40	[-.23, .09]
Internet Use at +1 SD Gains & -1 SD Losses	-.21	.12	.08	[-.44, .02]
Internet Use at +1 SD Gains & +1 SD Losses	-.03	.06	.67	[-.14, .09]

Domain-specific resources - Similar to the general-domain resources, we conducted three regression models for the specific-domain resources, in both young and older adults (self-efficacy, cognition, and social resources; see Multimedia Appendix 4). The first model showed that resource losses were the strongest predictor of stress levels across different age groups, regardless of the specific type of resource considered. The coefficient of losses for self-efficacy was found to be the highest in both young and older adults, with more losses being related to higher levels of stress in both groups. Moreover, higher gains in self-efficacy, cognition, and social were significantly predicting lower stress levels in young adults. However, in older adults, the only significant predictor was self-efficacy gains, with more gains being associated with less stress. These findings suggest that different types of resource gains may play varying roles in shaping stress experiences across different age groups.

Moreover, the impact of resource losses on stress in young and older adults was significantly influenced by their levels of gains, which varied depending on the type of resources. Those with high levels of self-efficacy and cognition gains tended to experience less stress when they also presented high levels of self-efficacy and cognition losses (young adults: unstandardized coefficient $\beta_{\text{Cognition}}$ = .21, confidence intervals at 95% [.08, .34] and $\beta_{\text{Self-efficacy}}$ = .20, [.08, .32]; older adults: $\beta_{\text{Cognition}}$ = .23, [.11, .34] and $\beta_{\text{Self-efficacy}}$ = .23, [.13, .34]), compared to individuals with lower levels of resource gains who tended to experience higher levels of stress under similar circumstances (i.e., young adults: $\beta_{\text{Cognition}}$ = .40, [.21, .60] and $\beta_{\text{Self-efficacy}}$ = .40, [.30, .50]; older adults: $\beta_{\text{Cognition}}$ = .37, [.23, .50] and $\beta_{\text{Self-efficacy}}$ = .43, [.30, .55]). While no significant results were present regarding social resources for young adults, older adults with high levels of social gains experienced less stress when they also presented high levels of social losses (β_{Social} = .18, [.04, .32]), compared to older adults with lower levels of

resource gains who experienced higher levels of stress under similar circumstances (β_{Social}= .45, [.23, .67]).

The study also revealed a significant influence of internet use on the relationship between resource losses and stress levels in both young and older adults, as indicated by the two-way interaction effect (Internet Use x Losses). Specifically, the interaction effect was found to be significant for different types of resources in young and older adults. Among young adults, a significant interaction effect was observed for self-efficacy and social resources ($\beta_{Self\text{-}efficacy}$ = .30, [-.02, .31]); (β_{Social} =.67, [.09, 1.25]). Specifically, young individuals who reported high losses in social and self-efficacy resources and had higher internet use experienced more stress compared to their counterparts with lower internet use. At the same time, young adults with low levels of social and self-efficacy losses and higher internet use exhibited lower stress levels than those with lower internet use.

In the case of older adults, a significant interaction effect was observed specifically for cognition resources ($\beta_{Cognition}$ =.08, [.00, .16]). Older individuals who experienced fewer losses in cognition and had higher levels of internet use reported lower levels of stress compared to individuals with lower internet use. Additionally, a significant two-way interaction effect between internet use and gain was marginally significant ($\beta_{Cognition}$ = -.09, [-.21, .02]). Older adults who had high gains in cognition resources and high levels of internet use exhibited lower levels of stress compared to older adults with lower internet use.

Finally, in older adults, internet use influenced the moderating role of self-efficacy gains between self-efficacy losses and stress, and the moderating role of social gains between social losses and stress. This was evidenced by the significant three-way interactions between internet use, self-efficacy gains and self-efficacy losses ($\beta_{Self\text{-}efficacy}$ = .07, [.01, .14]), but also between internet use, social gains, and social losses (β_{Social} = .11, [.03, .19]). Specifically, the third model presented an increase in the index of adjustment with the second one of .02 (ΔR^2 = .02; p = .03) for the self-

efficacy model, and .03 (ΔR^2 = .03; p =.006) for the social model.

It is important to note that in young adults, regardless of the type of resources, triple interactions between internet use, self-efficacy, cognition or social gains, and self-efficacy, cognition or social losses were not significant, in line with the findings on the triple interaction of the domain-general resources (see Multimedia Appendix 4). As the three-way interaction (Losses x Gains x Internet Use) was not significant in young adults, we reported only the conditional effects of the older adults. In older adults, conditional effects analyses (see Table 9 and Figure 3) revealed significant moderation effects of self-efficacy gains and internet use on the relationship between self-efficacy losses and stress. Specifically, the moderation effects were observed only when individuals reported high levels of self-efficacy gains and high levels of internet use (β = .29), as well as when individuals reported low levels of self-efficacy gains and high levels of internet use (β = .38), and low levels of both self-efficacy gains and internet use (β = .45). Moreover, significant moderation effects of social gains and internet use on the relationship between social losses and stress were observed only when individuals reported high levels of social gains and high levels of internet use (β = .19), and low levels of both social gains and internet use (β = .64). As for domain-general resources, present results suggest that the use of the internet increases the buffering effect of self-efficacy and social gains on the relationship between self-efficacy and social losses and stress.

Table 9. Conditional Effects of Domain-specific Resource losses (i.e., Independent Variable) on at +1 SD and -1 SD of Gains and Internet Use (i.e., Moderators) in Older Adults.

		Effect	*SE*	*p*	[LLCI, ULCI]
Self-efficacy					
	Losses at -1 SD Gains & -1 SD Internet Use	.45	.07	.001	[.31, .59]
	Losses at -1 SD Gains & +1 SD Internet Use	.38	.10	.001	[.18, .58]
	Losses at +1 SD Gains & -1 SD Internet Use	-.02	.12	.88	[-.26, .23]
	Losses at +1 SD Gains & +1 SD Internet Use	.29	.07	.001	[.15, .43]
Social relations					

	Losses at -1 SD Gains & -1 SD Internet Use	.64	.15	.001	[.35, .93]
	Losses at -1 SD Gains & +1 SD Internet Use	.23	.16	.16	[-.09, .54]
	Losses at +1 SD Gains & -1 SD Internet Use	-.02	.14	.88	[-.29, .25]
	Losses at +1 SD Gains & +1 SD Internet Use	.19	.08	.02	[.02, .36]

Figure 3. Plots of Three-way Interactions Effects for the Self-efficacy Model (Self-efficacy Losses x Self-efficacy Gains x Internet Use), and the Social Model (Social Losses x Social Gains x Internet Use) in Older Adults.

As for the general-domain resources, we conducted an additional analysis to examine the differences between older adults with high internet use and those with low internet use in relation to their gains and losses (Table 10). As the three-way interaction (Losses x Gains x Internet Use) was not significant in young adults, we reported only the conditional effects of the older adults. Results showed that the internet use effects (i.e., differences between participants who used more internet with participants who used less internet) were observed in older individuals who reported high levels of self-efficacy gains and low levels of self-efficacy losses (β = -.21). Moreover, significant internet use effects were observed in cases where older adults experienced low levels of social gains and high levels of social losses (β = -.18), as well as in older individuals with low levels of social gains and high levels of social losses (β = -.17)

Table 10. Conditional Effects of Internet Use (i.e., Independent Variable) on at +1 SD and -1 SD of Domain-Specific Resource Gains and Losses (i.e., Moderators) in Older Adults.

		Effect	*SE*	*p*	[LLCI, ULCI]
Self-efficacy					
	Internet Use at -1 SD Gains & -1 SD Losses	-.01	.05	.82	[-.11, .09]
	Internet Use at -1 SD Gains & +1 SD Losses	-.06	.07	.39	[-.19, .07]
	Internet Use at +1 SD Gains & -1 SD Losses	-.25	.11	.02	[-.46, -.04]
	Internet Use at +1 SD Gains & +1 SD Losses	-.05	.06	.39	[-.16, .06]

Social relations					
	Internet Use at -1 SD Gains & -1 SD Losses	.03	.06	.57	[-.08, .15]
	Internet Use at -1 SD Gains & +1 SD Losses	-.17	.09	.07	[-.35, .01]
	Internet Use at +1 SD Gains & -1 SD Losses	-.18	.08	.03	[-.34, -.01]
	Internet Use at +1 SD Gains & +1 SD Losses	-.08	.06	.20	[-.19, .04]

Discussion

This study investigated the influence of internet use on the relationship between personal resources and stress in both young and older adults. Findings indicated that older adults were less stressed than younger adults. Moreover, resource gains moderated the relationship between resource losses and stress, and this effect was similar in both young and older aged individuals. Finally, internet use seems to act as a buffer on the dynamics between social and self-efficacy resource losses and stress, amplifying the positive influence of resource gains in reducing the adverse effects of these losses. In older adults, internet use was beneficial as a mean of dealing with losses in social and self-efficacy resources.

Age-Associated Differences in Stress Levels

In support of our first hypothesis, we found that older individuals reported less stress than younger adults. This finding is consistent with extant research which has also documented the stress-buffering effect of age among older adults. This phenomenon has been attributed to several personal factors, including cognitive and emotional processing differences between age groups [64-65], greater use of emotion regulation strategies [66-67], and greater life experience and wisdom that allow for more effective coping with stressors [68-69]. Moreover, older adults may be more skilled at regulating their emotions, which may reduce the impact of stressful events on their psychological well-being.

Specifically, stress-inducing situations are related to an increase of negative emotions, and several studies showed that older adults tend to experience more positive and less negative emotions [70-71-72-73-74]. Therefore, it can be inferred that older adults may possess greater capacity to regulate and inhibit negative emotions, leading to a reduced impact of stressful events on their psychological well-being. Older adults may further be more resilient than younger adults due to their accumulated life experience and developed coping mechanisms, including proactive problem-solving strategies, effective emotion regulation, and a strong sense of personal control and self-

efficacy [75-76-77-78]. For example, several studies reported a coping shift during aging to match with the constraints experienced during aging and preserve well-being [79-80-81-82]. Older adults, who often face a range of losses associated with aging, such as declining health, social network changes (e.g., death of partner), and retirement, tend to exhibit a greater preference for accommodation, including emotion- and cognition-focused coping. In contrast, younger adults, who typically have fewer losses, displayed a higher preference for assimilation, including problem-focused coping and actively sought solutions to alleviate stress, reflecting their developmental stage characterized by a stronger drive for achievement, personal growth, and the ability to confront different types of challenges. The observed shift from assimilation to accommodation [19] across the lifespan suggests a developmental trajectory in coping strategies, with older adults adapting their coping approaches to address the unique challenges and losses they experience. Overall, older adults may be more resilient to stress than younger adults, and their adaptive coping strategies, social support, as well as their emotion regulation strategies may contribute to their ability to maintain psychological well-being in the face of adversity.

Resource Gains Moderated the Relationship Between Resource Losses and Stress Levels

We found that resource gains moderated the relationship between resource losses and stress levels, confirming our second hypothesis. In line with the COR theory [20], we found that resource gains buffered the negative impact of resource losses on stress levels. More specifically, COR theory emphasizes the significance of resource gains, which have the potential to assist individuals in restoring their resources and avoiding further depletion. The gain paradox posits that individuals who have experienced losses are more likely to recognize and appreciate resource gains. This phenomenon can be attributed to the increased awareness among individuals of the value and importance of resources as a result of experiencing losses, which in turn serves as a motivation for them to actively seek and increase those resources. Consequently, resource gains are crucial in

moderating the negative relationship between resource losses and stress levels, as individuals with greater resource gains possess better coping abilities and are more likely to recover from losses [21].

Replicating Hobfoll's COR theory [20], we also found that resource gains buffered the impact of resource loss in both age groups on stress. That the same buffering effect was found in both age groups could be attributed to some universality of the losses–gains dynamics across life phases. The COR theory posits that individuals across the lifespan share a fundamental drive to accumulate and protect resources as a means of maintaining well-being and minimizing stress [20]. Therefore, the importance of resource gains in mitigating the negative impact of resource losses on stress levels may hold regardless of age.

Relationship between Internet Use and Domain-Specific Resources on Stress in Young and Older Adults

Additionally, the present study revealed distinct patterns of interaction between internet use, as an external technical resource, and domain-specific personal resources on stress levels for young and older adults. Our findings suggest that the relationship between social or self-efficacy losses and stress levels in young individuals is significantly influenced by their utilization of the internet. Specifically, young individuals who reported fewer social or self-efficacy losses experienced lower levels of stress when they used the internet, indicating a buffering effect. On the other hand, those who reported higher social or self-efficacy losses exhibited increased levels of stress when they used the internet, suggesting an exacerbating effect. These results highlight the complex interplay between social or self-efficacy losses, internet use, and stress levels among young individuals. It appears that the internet may serve as a supportive resource for individuals with fewer social losses, providing them with a mean for social connection and support [83]. Furthermore, the internet may serve as a resource for providing access to information, support, and opportunities for skill development, which can bolster self-efficacy beliefs, resilience, and promote adaptive coping strategies [84-85-86-87-88]. However, for those experiencing higher social or self-efficacy losses,

the internet may exacerbate stress. Indeed, the losses in social resources, such as social contacts, are associated with higher feelings of loneliness [89], which contributed to the development of excessive internet use, commonly referred to as internet addiction [90-91]. This pattern of excessive internet use, driven by the absence of social support and challenges in communication, emotion identification, and regulation, is linked to higher levels of stress [92-93]. This suggests that individuals experiencing significant social losses may increase their use of the internet as a compensatory mechanism to mitigate the impact of these losses, resulting in increased stress levels. Moreover, past research has documented as generational-situated use of the internet, with young adults using it for leisure activities, while older individuals' preferred use of the internet is to facilitate the realization of daily activities, such as medical consultations [94-95].

Additionally, the present study highlights an interesting pattern regarding the relationship between internet use, cognitive losses, and stress levels among older adults. Specifically, older adults with lower levels of cognitive losses who engaged in internet use experienced lower levels of stress compared to those who did not use the internet, suggesting that internet use may serve as a protective mean against stress for older adults with fewer cognitive losses. One possible explanation can be that internet use provides opportunities to be engaged in online activities for cognitive stimulation, accessing information, or social interaction [8-96], which may help mitigate the negative effects of cognitive losses on stress levels. Considering that higher frequency of digital device use was associated with fewer subjective cognitive concerns [97-98-99], and that cognitive losses were associated with higher levels of stress in the older adults [23-100-101], we found that older adults with less cognitive losses who used the internet more were less stressed compared to older adults who did not use the internet, suggesting a buffer effect of internet use on the relationship between cognitive losses and stress.

However, older adults with high levels of cognitive losses experienced similar levels of stress regardless of their internet use. This suggests that the influence of high cognitive losses on stress may remove any potential benefits derived from internet use. It is possible that older adults

with high cognitive losses may have difficulties using internet effectively due to their subjective cognitive losses that could be explained by the digital distraction hypothesis [102-103-104]. According to this hypothesis, increased engagement with technology may have detrimental consequences for cognitive processes, manifesting as executive dysfunction characterized by heightened distractibility, superficial cognitive processing, and difficulties in task organization and completion. Additionally, technology reliance may contribute to increased forgetfulness by undermining the natural memory systems employed for tasks such as navigation or recalling personal information, like phone numbers [102-104]. The detrimental effects of excessive digital engagement on cognitive functioning may override any potential benefits of internet use for stress reduction in older adults with higher cognitive losses.

Internet Use Moderated the Moderation Between Resource Losses, Gains, and Stress Levels in Older Adults

The final hypothesis of our study which examined the influence of internet use on the relationship between resources and stress was confirmed for older adults. More specifically, older adults with fewer losses in self-efficacy and social resources, and greater gains in these domains, experienced lower levels of stress when they engaged in more internet use. This suggests that the internet can be considered as an “amplifier” of the positive effects of resource gains, particularly in terms of self-efficacy and social resources.

Previous studies reported that the internet use by older adults has been associated with decreased loneliness and depression, better social connectedness, self-esteem, and cognitive functioning [105-106], improved self-efficacy, self-control, self-determination, and skills development [107-108-109-110-111]. For example, the study by Karavidas and colleagues [110] examined the association between internet use, self-efficacy resources, and life satisfaction among older adults. The results revealed a positive correlation between internet use and life satisfaction. This relationship was mediated by self-efficacy resources, indicating that increased internet use

among older individuals was associated with the development of higher self-efficacy skills, which, in turn, contributed to an improved overall quality of life. The findings suggest that frequent internet use may serve as a platform for older adults to develop and enhance their self-efficacy, leading to greater life satisfaction. Similarly, Chaumon and colleagues [107] found that older adults with functional loss living in long-term care institutions showed a positive impact of internet use on self-sufficiency, self-efficiency, and psychological empowerment [112].

Moreover, the internet facilitates stronger social connections and easier access to social networks, such as through engaging in online conversations with new contacts or actively participating in virtual social events [76-105-107-113]. For example, White and colleagues [105] presented a randomized controlled trial to investigate the psychosocial impact of providing internet training and access to older adults. The study involved a sample of older individuals who were randomly assigned to either an intervention group, which received internet training, or a control group that did not receive any intervention. Results showed significant improvements in several psychosocial factors among the intervention group compared to the control group. Specifically, older adults who received internet training reported increased social support, higher levels of social engagement, reduced feelings of loneliness, and enhanced subjective well-being. These findings suggest that providing older adults with internet training and access can have positive effects on their psychosocial well-being.

In line with previous findings, we found that internet use can support the buffer effects from gains in self-efficacy and social resources when individuals have low levels of losses in each type of resources, respectively. Moreover, internet use can also substitute the effects of gain in older adults with low gains and high losses. More specifically, our findings demonstrated that individuals who reported high losses and low gains in social resources experienced lower levels of stress when they engaged in more internet use. This can be attributed to the compensatory role of the internet in filling the gaps caused by the limited gains in social resources. Several studies provide evidence supporting the notion that the internet can compensate for losses in social resources among

individuals [114-115-116-117-118]. Older adults who experience a decline in face-to-face social interactions due to factors such as retirement or physical limitations can benefit from online social networking platforms. For example, Khoo and Yang [116] conducted a study that examined the impact of social media use on the perception of social support among middle-aged and older adults. The researchers found that utilizing social media platforms for interactions with broader social networks, such as friends, was equally beneficial as using them to connect with family members in terms of enhancing social support.

Limitations

The present study entails certain limitations that warrant consideration. These pertain both to the representativeness of the recruited sample and to the measures employed therein [119]. On one hand, the results should be interpreted cautiously due to potential sampling error. Indeed, stemming from a non-probabilistic sampling approach, the characteristics of participants who voluntarily engaged in the study may also influence variables of interest [119-120]. For instance, participants' income could influence both their willingness to participate in surveys [121], their resource losses and gains, and their internet use [122]. Consequently, the employed sampling strategy (i.e., snowball volunteer sampling) likely did not capture older individuals marked by resource losses and socio-demographic characteristics (e.g., isolation, low socioeconomic status, etc.) that are particularly stressful.

On the other hand, the nature of the measures employed may introduce limitations. Results should be interpreted with caution when examining age-related differences in the role of internet use. Reflecting on the issue of causality, it is important to consider how the cross-sectional nature of our study limits our ability to ascertain changes in internet use and its effects over time, especially across different age groups [52]. While we have identified associations between changes in personal resources, stress levels, and internet use, these findings are not sufficient to establish a causal link or to delineate the temporal evolution of internet use's impact on stress and personal resources. This

caution extends to interpreting the dynamics of internet use across the lifespan, where cross-sequential research is essential for distinguishing between the effects of aging and those attributable to cohort-specific experiences or generational differences [94].

Moreover, the decision not to include age group as a factor in an interaction analysis was based on significant differences in internet use between young and older adults. Preliminary findings indicated uniform high usage among younger participants, which could confound nuanced age-related interactions with internet use and stress outcomes. Therefore, analyses were conducted separately for each age group to accurately capture distinct usage patterns, especially among the older adults who demonstrated a broader range of internet behaviors. This approach helped avoid the confounding effects of uniform usage in younger. However, it limited the exploration of broader age-related dynamics, potentially affecting a comprehensive understanding of how age influences the relationship between Internet use and stress.

Additionally, it is essential to recognize that this present study focuses primarily rests upon the frequency of internet use, measured equivalently for both younger and older adults. This approach, however, disregards the plausible generational disparities in internet usage patterns as noted in previous research [94-123], which might inadvertently introduce errors in measurement [119]. Notably, the lack of statistical significance concerning the impact of internet use on stress in young adults, a group extensively engaged with the internet, might potentially be attributed to the distinct "youthful" internet usage styles, as proposed by Boullier [94]. Indeed, the presence of measurement errors, such as those arising from questionnaire elaboration, can introduce challenges such as ceiling and floor effects [119-124], impeding the identification of statistically significant differences between groups [125]. Moreover, future studies should develop measures to better capture interindividual differences in internet use in younger individuals, in order to further investigate the multifaceted relationship between internet use and different age groups.

Moreover, the consideration of a singular internet use style in measurement limits the

possibility of identifying the styles that may be most beneficial for each age group during resource losses. Indeed, the beneficial role of internet use derives from the meanings attributed to its use and the opportunities it offers to address needs [126-127-128]. Consequently, it would be of great interest for future studies to focus on identifying favorable internet use styles for stress reduction in a context of personal resource loss, across different age groups.

Conclusion

The present study examined the role of internet use on the relationship between personal resources and stress. The findings revealed a nuanced understanding of how digital engagement can serve as a buffer against stress, particularly among older adults who experienced resource losses and gains. Specifically, older adults who frequently used the internet reported less stress when exposed to both high levels of resource loss and gain compared to their counterparts with lower levels of internet engagement. This underscores the importance of internet use in mitigating stress among older adults, highlighting the potential of digital tools in promoting well-being in older populations.

The study's novel contribution lies in its empirical support for the beneficial role of internet use among older adults within the framework of Hobfoll's Conservation of Resources theory [20]. By demonstrating that internet use can moderate the effects of resource losses and gains on stress, the present research provides valuable insights for developing targeted interventions aimed at leveraging technology to support well-being. Understanding these dynamics will help researchers, practitioners, and policymakers to recognize the role of the internet as a facilitator of resource gains and as a compensatory mechanism for social deficits in older adults. Encouraging and supporting older adults in utilizing the internet can promote access to valuable resources and enhance their self-efficacy and social connections, ultimately contributing to improved stress management, and, more generally, well-being.

Authors' Contributions

AR was responsible for the study design, data collection, analysis, interpretation and writing of the original draft. PM contributed to the analysis, interpretation, writing, review and editing of the draft. KL contributed to the study design, and review. DJ contributed to review and editing of the draft. All authors agreed to the submission of the final version.

Conflicts of Interest

None declared.

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Supplementary Files

Figures

Mean Stress Depending on Level of Gains (High vs. Low) and Losses (High vs. Low) in Young and Older Adults. Slopes' Values Represent the Coefficient and the Confidence Intervals at 95%.

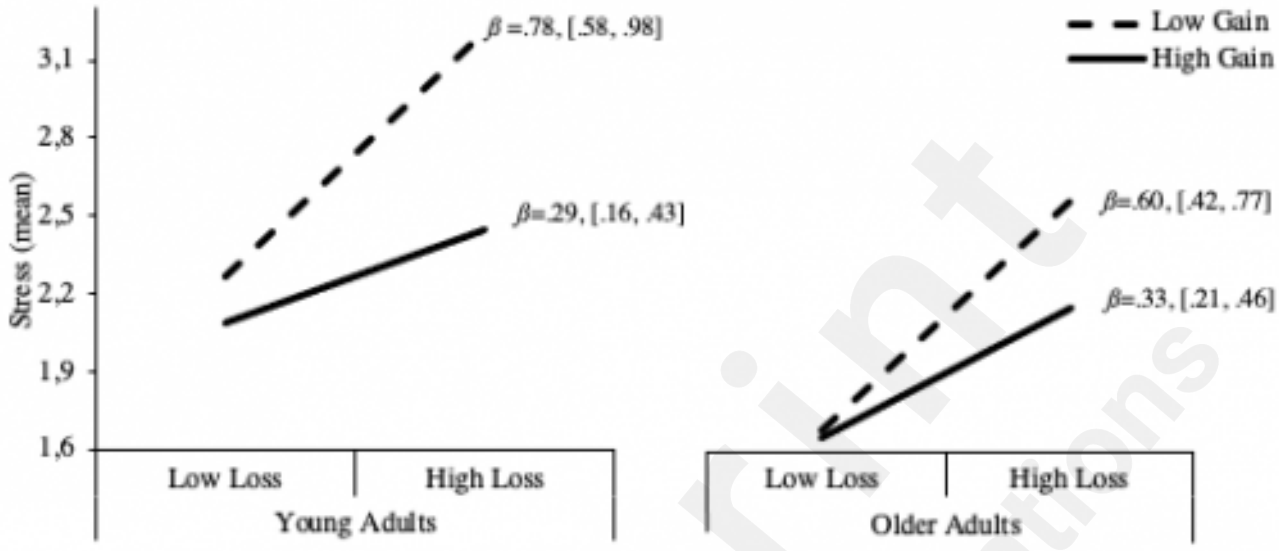

Figure 1. Mean Stress Depending on Level of Gains (High vs. Low) and Losses (High vs. Low) in Young and Older Adults. Slopes' Values Represent the Coefficient and the Confidence Intervals at 95%.

Mean Stress Depending on Level of Gains (High vs. Low), Internet use (High vs. Low), and Losses (High vs. Low) in Older Adults.

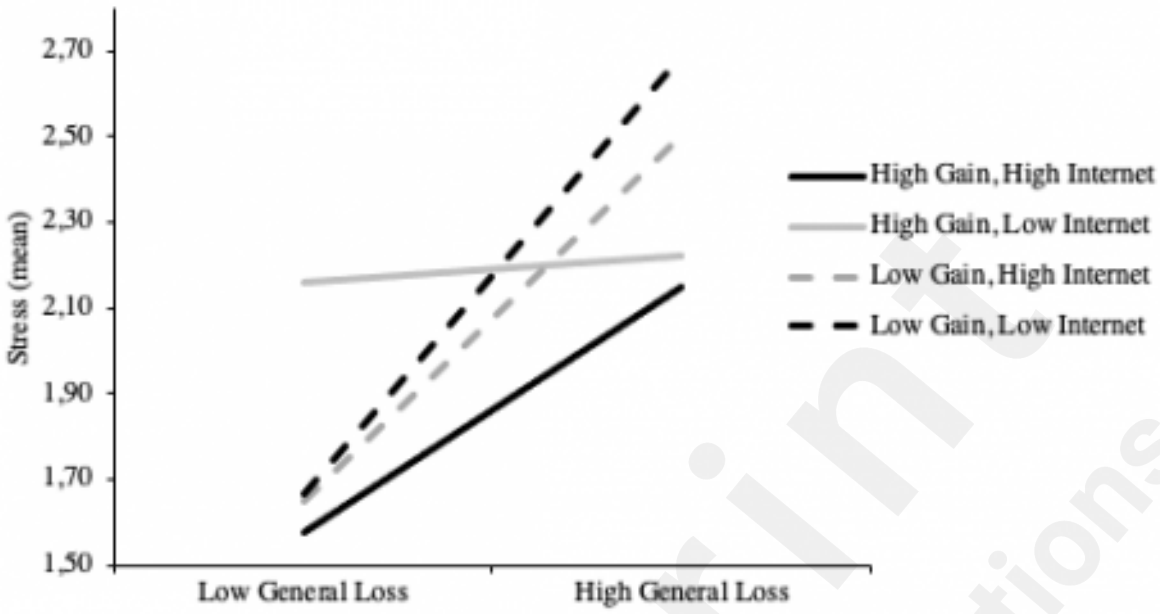

Figure 2. Mean Stress Depending on Level of Gains (High *vs.* Low), Internet use (High *vs.* Low), and Losses (High *vs.* Low) in Older Adults.

Plots of Three-way Interactions Effects for the Self-efficacy Model (Self-efficacy Losses x Self-efficacy Gains x Internet Use), and the Social Model (Social Losses x Social Gains x Internet Use) in Older Adults.

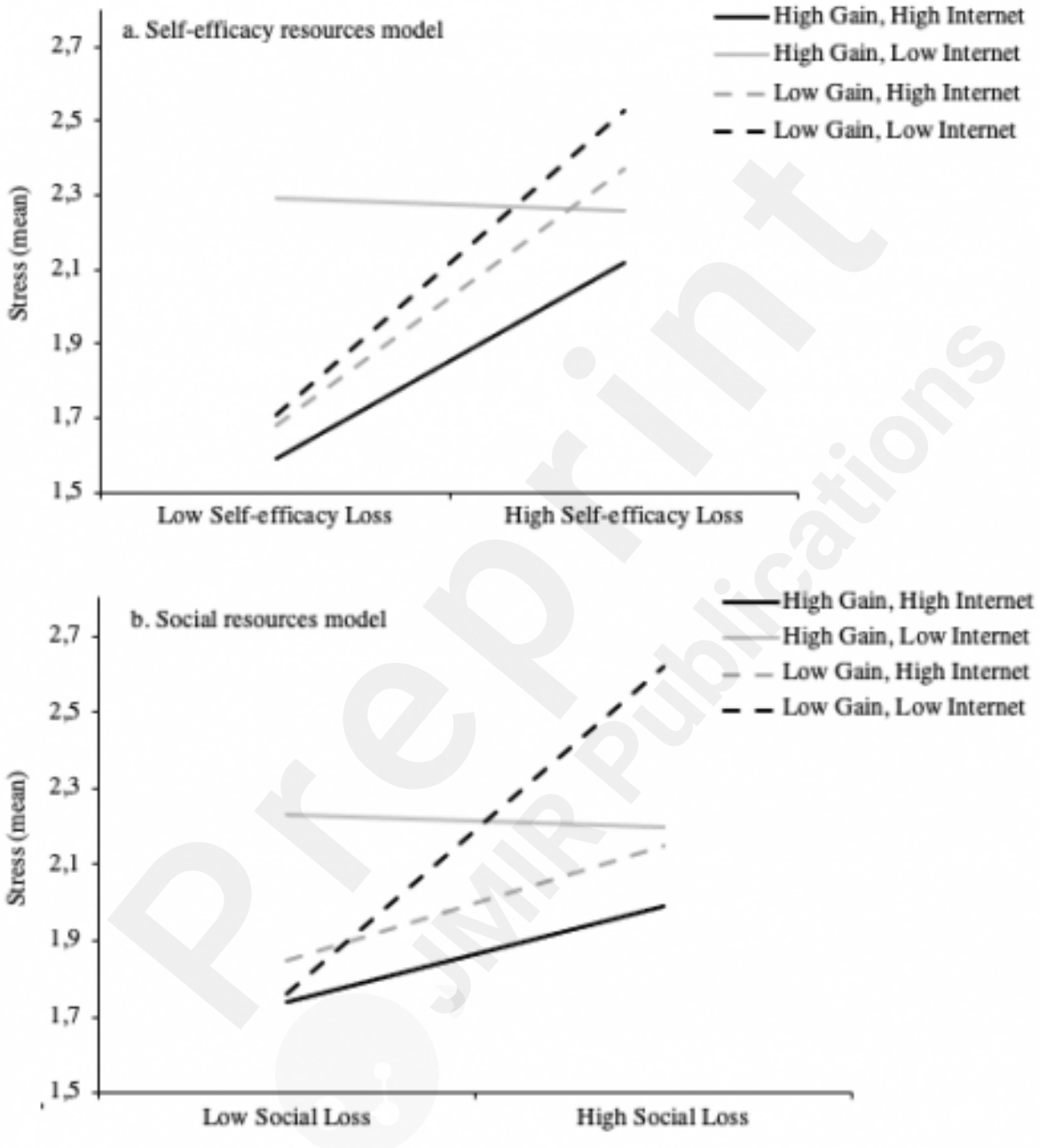

Figure 3. Plots of Three-way Interactions Effects for the Self-efficacy Model (Self-efficacy Losses x Self-efficacy Gains x Internet Use), and the Social Model (Social Losses x Social Gains x Internet Use) in Older Adults.

Multimedia Appendixes

Checklist for Reporting Results of Internet E-Surveys (CHERRIES).
URL: http://asset.jmir.pub/assets/33fde6a19bd48c7ec9480aa3b37ba1ae.docx

Pearson’s Correlations (r) Between Main Variables.
URL: http://asset.jmir.pub/assets/df3c239036c88097efdf7325edf5f1fd.docx

Unstandardized Regression Coefficients for Domain-specific Resources (Self-efficacy, Cognition, and Social Relations) in Young and Older Adults.
URL: http://asset.jmir.pub/assets/478bfb9c2642ab890153abb41bf18526.docx